Secretaries

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Disceptatio de Theoria Secretionis

"Secretionis nimis equidem latine nomine intelligitur ea corporis animati functio, qua, de communi sanguinis massa, alii, et a sanguine diversi, et a se ipsis varii, humores ea lege parantur, ut in qualibet ejus corporis particula idem constanter humor generetur" — Haller

Among the numerous physiological subjects presented for the investigation of the student, none appears to be of a more interesting, but at the same time complicated nature, than that of the Animal Secretions. It offers a wide field for speculation, and here, as in almost every other case of a similar kind, the many and altogether different theories, which have been at various times brought forward in order to account for this singular process of nature, have nearly equalled in number the authors who have written on the subject. It really appears, that the greater the talent

employed to investigate this point, the more hypothetical has been the doctrine assumed.

That this assertion is not merely imaginary, is clearly evinced by a reference to the records of physiology. We shall there find many beautiful theories and speculations, but most of them having no other foundation than the brilliant imaginations of their ingenious authors. It is, it must be acknowledged a very seducing topick, the mind is gradually led on from one assumption to another and is only bounded by the ingenuity of its inventor, the whole presenting neither more nor less than a theory of suppositions. This would appear to be applicable to most of the early opinions advanced for the purpose of elucidating the mechanism of secretion. Later experience and more extensive research have enabled us to lay down a theory less objectionable and more consistent with other well known operations occurring in that most complicated of all creation, Man!

I am sorry, however, to be under the necessity of acknowledging, that we are still obliged to call on the power of invention to assist in clearing up many of the obscure points yet existing in this wonderful process.—

Having premised thus much, I will proceed to take into consideration, that which more properly constitutes the Subject of the present essay. As, however, the physiological account, as well as the vital properties of those organs called Glands, cannot well be seperated from the Subject of secretion, I think it will be best to take those two points also into our examination and having that intention in view shall make the following arrangement.

First— The various classifications of the Secretions by different writers

Second— A general view of glandular organizations

Third— The Subject of Secretion with a short account of the theories that have been invented in order

order to shew how, and in what manner this process is accomplished.

The animal fluids are by no means so easily arranged, as a superficial examination of them might lead one to suppose.

That classification which appears first to have been formed was into secretions and excretions; but it is evident that the latter is as much a secretion as the former, for the excretions must first be formed from the general mass of blood before they can be excreted, and this very formation is itself a process of secretion. It is clear, therefore, that this arrangement is entirely objectionable.

A second classification was that into recrementitious and excrementitious humours; and was founded on the uses to which the fluids seemed to be destined; the former comprehending the chyle, blood serum, lymph &c and which were supposed to be intended for the growth and nourishment of the body; and the latter, including those which were

expelled from the body as noxious; as the urine, perspiration &c. A third class was composed of such fluids as appeared to partake of the character of both the foregoing; one part being rejected as injurious to the System, and the other retained as necessary to a healthy State of the animal oeconomy. It consisted of the Saliva, bile, pancreatic juice, mucus of the intestines &c. and were called excremento-recrementitious Humours. But this is also to be objected to; it is altogether hypothetical, not being supported by a single fact. Where is the proof that the matter of perspiration carries off from the body a substance which, if retained would prove injurious to it? Or why is the fluid of the pancreas placed in one of those divisions in preference to another?

The most simple division I have any where met with is that of Pitcairne; he distinguishes them merely as being thick or thin; and this method was also adopted by Michelotti. The argument against this is

is, that almost all the secretions are varied in their consistence by the slightest causes; as passions of the mind, irritations applied to the secreting surface or gland &c. Therefore this cannot be adopted.

Haller has distributed the secretions into four classes. The first consists of acid fluids coagulable by a heat of 156° Farenht; also by Alcohol and strong Acids. To this class belong the liquor of the ventricles of the brain, of the pericardium, pleura, peritoneum, tunica vaginalis, amnios, joints, renal capsules, and probably of the womb, with the juices of the stomach and intestines, and lastly of the lymph generally. His Second class consists of fluids, some of which are exhaled as in the preceding class, but still he considers them more simple in their composition or approaching nearer to the nature of water, they are not coagulable as those of the first section, but some of them are exhaled; the rest are not, being merely received into, and sent from, the proper excretory

duct of the gland. Here are placed the perspirable matter, the tears, watery humours of the eye, saliva, pancreatic juice and the urine.

The third consists of fluids not coagulable into a jelly, but which by exhaling their watery parts become hard dry crusts; they are thickened by the addition of an Acid and heat decomposes them into water, a small quantity of volatile salt, and a little oil. In this order he places all the mucus of the body lining the internal passages for air, aliments or urine; the cavities of the genital parts and also that composing the Semen.

In the fourth and last Class are arranged the inflammable juices. These, he says, when recent are thin, but by stagnation and by evaporating their watery parts, become thick oily and inflammable and often bitter liniments. Here we find enumerated the bile, earwax tallow, the oily liniment of the Skin, the marrow of the bones, and all the fat throughout the human body.

Haller

These then are the four divisions to which he refers the animal secretions; he observes, however, that some are of a mixed nature and therefore do not belong decidedly to either class, but ought, from the diversity of their principles, to be referred to more than one.

The defects of this arrangement are so palpable and the facts we are in possession of, so decidedly opposed to what Haller believed really to exist, that very little will be required to subvert it completely. In the first place not a single one of those which he has called a simple element, is so in reality; for if I understand him correctly, he considered most of the secretions as simple, and when all unities composing that general mass presented to the glands for the purpose of seperation. He is however, himself compelled in part to renounce his own doctrine, for he acknowledges some of the secretions to be composed of two elements; as the milk of butter and water; perspiration of water and the sub-

=cutaneous

did Harvey. But the present state of Chemistry enables us to shew most unequivocally, that each, and every one of the secreted fluids, are in themselves a compound, though we are not able to distinguish the exact proportions of each ingredient. We also know from analysis that the blood contains all the principles of which the different secretions are formed; yet it proves with the same degree of certainty, that not one of the secretions is to be detected in its formed state in the general circulating mass.

The secretions are placed in a manner considerably different from that of Haller by Blumenbach and so far as I know is original.

He classes them in proportion as they differ from the Chyle; thus he considers the productions of the female mamma as differing least from the fluid taken up by the lacteals, and this he places in the first order. Next in gradation from the Chyle he considers the watery secretions;

such as the ~~watery~~ humours of the eye, the wax, the fluid moistening the peritoneal and pleural surfaces, the liquor pericardii, the exhalations into the ventricles &c. In the third class he places the mucous fluids; as the secretions of the nose, larynx and respiratory organs, and also the fluid spread over the surfaces of most of the viscera belonging to the natural and generative functions. In the fourth section are arranged the adipous fluids; as the fat, the medulla of the bones, the sebaceous matter of the skin including also the cerumen of the ear; here too is placed the secretion of the Meibomian Palpabral glands. The semen he considers altogether distinct from any of the other secretions forming a seperate order; and the same is his opinion with respect to the bile.

Of this classification I shall only say, that were it possible to fix a regular gradation in proportion as the secretions differ from the chyle, such an arrangement would be highly satisfactory; but at

present our knowledge is not sufficient on this point to enable us to make such a distinction. So far as analysis has yet gone it only marks a characteristick difference to exist between each and all of the fluids, which is by no means in favour of that arrangement where two or more of them are classed together. To the science of Chemistry we must look for a complete solution of this problem.

In Dumas's Principles of Physiology we find a plan considerably different from any we have yet noticed, and which he declares to possess the advantages of connecting closely the knowledge of the fluids with that of their uses. He has considered the human body as divided into seven organic systems, each being again subdivided as follows. First. Fluids of the nervous or Sensitive System; comprehending the fluids of the ventricles of the brain, Aqueous, Vitreous and Crystaline humours of the eye, the tears, the meibomian secretion, mucus of the nose, cerumen, fluid of the la-

labyrinth of the ear and the Saliva —
Second — Of the Muscular or Moving System; as the fibrin, serosity and fat —
Third — Of the Vascular or calorific System; as the mucus of the trachea and air vessels, fluid of the pericardium and pleura, the pulmonary exhalations and the blood —
Fourth — Of the visceral System or organs of Supply to which is referred the mucus of the mouth, pharynx and oesophagus, the mucus of the stomach intestines and bladder and Kidneys, the gastric pancreatic and intestinal fluids, exhalations of the abdominal cavity, the bile, liquor of the renal capsules and the Urine —
Fifth — Of the lymphatic or collecting System; to which belongs the residues of the fluids and of nutrition, the lymph, fat of the cellular tissue and the mucus fluids —
Sixth — Of the Sexual or reproductive System; as the prostatic liquor, mucus of the urethra

and vagina, the Seminal fluid, exhalation of the tunica vaginalis, contents of the ovarian vesicles, the liquors amnii and meconium. And Seventh - Of the bony or supporting System; as the gelatine, medulla and synovia &c —

This is undoubtedly the best arrangement I have yet spoken of; but I would object to it, from its being unnecessarily complicated, and also from the numerous and seperate divisions of fluids possessing great similarity, and which, I think, might be more advantageously classed together —

Fourcroy in his Elements of Chemistry, distributed the Secreted fluids according to their constituent principles, as they appeared on analysis; but, from the defective State Chemistry was then in, his plan was found altogether useless; indeed he himself appears to have been of the same opinion, as he has not adopted it in his later publications — After all however we cannot but declare, that every classification must be, at least

in the present State of Science, in a great measure merely arbitrary — As the office of Secretion depends on a particular Structure called glandular, I shall place them in that order, which shews them, on dissection to be more complicated in their Structure; for by an attentive examination we shall find, that the more the Secreted fluids appear to differ in their Sensible qualities from the Style, or the general mass of blood, the more intricate is that organ by which they are produced — Some objections might probably be urged against this method, but, as I do not believe, that one distribution more than an other will be of the slightest use in explaining the manner in which Secretion is effected; I cannot consider it of much importance, which of those arrangements be adopted — To explain, however, the one which I prefer —

The most simple Structure, which appears to perform Secretion, is an extended membrane, whose

the primary secreting duct, opens immediately on the surface, without the intervention of any membranous cavity or sack; to which order I would attach, the exhalations from the surface of the body and the effusions into the general cavities —

In the second class I place, the mucous follicles. Here we perceive the primary secreting tubes depositing their contents, in a membranous sack, which sack, appears to have but one orifice communicating with the surface it is intended to moisten, as occasion may require — The fluid thus collected, is thicker in its consistence, in proportion to the length of time it is allowed to remain in those sacks; this can be explained, only by supposing, that an absorption of its more watery parts is continually going on, and vice versa, when the secretion is preternaturally increased by irritants or other causes, the fluid discharged is evidently thinner, and this in proportion to the degree of irritation applied — To this class belong all the mucous secretions throughout the

whole body; as the nose, root of the tongue, bronchial vessels, intestines, urethra &c.

In the third class I would arrange, such as appear to be made up of a dense parenchyma, without any apparent seperation into lobes or acini, as are those we shall presently notice. This structure is most evident in the Prostate.

In the Fourth Section are those glands made up of numerous acini, and lobes, which last are connected together by very loose cellular substance; as the pancreas, ~~Coccygeal~~ lachrymal, and Salivary glands &c.

The Fifth, consists of those glands, where no primary seperation into lobes are to be seen, the whole being composed of innumerable minute acini, joined together by very short cellular fibres; as the liver, Kidneys, &c. And here I believe we may also place the mammæ.

Sixth, and last, that arrangement which we perceive in the testicle, and which appears to me to be peculiar to it.

These last appear to be the most complicated in their structures, and we accordingly find their products to be farthest removed, in their general appearance, and qualities, from those elements, taken either seperately or collectively, composing the general circulating mass.

From the classification of the secretions, I pass to the examination of the second Section of my thesis, viz of the organization of glands

There is probably no structure in the whole of the human frame, that has been examined with greater attention or more minuteness, than the ultimate arrangement of the glandular tissue. It differs from the rest of the animal structure, in having not the slightest appearance of a fibrous texture. Its component parts appear to be thrown together without any of that regularity, we may observe in the bones, tendons, muscles, &c, being connected more or less closely by cellular substance. Where this is short, as

in the liver, and kidneys, the tissues possess less strength, requiring but little force to fracture it. The broken surfaces appear uneven, which distinguishes this from cartilage, the rupture of which is generally smooth. Technically speaking, the glandular tissue is called parenchyma. This appears to be disposed in three different ways in the glandular viscera. In the pancreatic, salivary, and lacrymal glands, the organ appears to be made up of numerous lobes connected together by cellular substance. These can again be divided by into smaller portions called acini, joined together in the same manner, but of course by a much shorter fibre; we may in this way make a second, a third, and even a fourth subdivision with a scalpel; these bodies becoming firmer as they decrease, from the connecting substance being shorter, and consequently stronger. By acini then we are to understand, the component parts into which a gland may be seperated.

In the liver, and kidneys the structure seems somewhat different; there are no primary divisions into larger and succeeding lobes as those already described; the whole of those two glands shews nothing but the acini connected together by short cellular substance; this will account for the ease with which those viscera may be fractured, and the peculiar granulated appearance the broken surfaces display — The prostrate, and tonsils, have neither lobes nor acini; the first consisting of a uniformly firm parenchyma, the second of a substance somewhat pulpy —

Thus we perceive, that by a careful dissection most of the glands can be resolved into very minute acini; the question will then naturaly arise, what is the ultimate structure of those grains? With a view of setling this point, the greatest attention was given to the subject by two very eminent anatomists, Malpighi and Ruysch — They resorted to magnifying glasses, and very fine anatomical injections;

but their conclusions were diametrically opposite. Malpighi taught, that the acina are hollow; that the arteries distributed through the glands, deposite their fluids in these cavities; that here the fluids underwent the necessary changes; and that it is conveyed thence by an excretory duct; that the union of these tubes formed larger excretory canals &c. He believed the larger glands, to differ from the smaller ones, as the mucus glands of the mouth, alimentary canal, &c, only as consisting of an aggregation of the same simple structure.

The opinion of Ruysch was, that all the glands were composed of cellular substance and vessels, without any membranous cavity intervening between the bloodvessels and excretory ducts. He was remarkably successful in minute injections, and the ideas he had formed on this subject appear, even down to the present time, to be more generally received than those of the first named anatomist.

The only advantage that appears to have resulted

from this controversy, was, a very close examination of the structure of glands; but it does not seem to have thrown any light whatever on the process of secretion. It is just as easy to conceive of its taking place in the organization described by Malpighi, as in that laid down by Ruysch. But the opinions of both Malpighi and Ruysch, were strenuously controverted by the Italian anatomist Mascagni. He declared that the arteries terminated only in veins, and consequently neither gave origin to exhaling vessels, nor communicated with the excretory ducts of glands. He believed, that the glands contained a great number of minute cells; that the arteries, veins, and absorbents covered the surface of those cells in great numbers, but very irregularly; and that from the cells small canals originated, which, uniting together, formed the excretory ducts. It was his opinion, that the secretions oozed out, as it were, through pores, or orifices in the bloodvessels, into the membranous cells, passing from these into the canals and thence into the excretory

ducts &c. Now the remarks I have before made regarding the opinions of Malpighi and Ruysch, are equally applicable to the doctrine held by Mascagni; for it leaves us just as much in the dark, with respect to the manner in which secretion is effected. The late Mr. Hewson seems to have been of the same opinion as Ruysch; for, in his Experimental Enquiries, he declares it to be his belief, that the globular bodies scattered through the kidneys are merely convoluted arteries, and also, that the acini in the mamma are the minute ramifications of the excretory duct.

These are the best authenticated facts, I have been able to collect on the texture of the glands; they are certainly interesting, though they afford little or no information in explaining in what way the Selecting process goes on. Here then I will conclude what I have to say relative to the composition of glands. I shall, therefore, now pass to the third, the most difficult but by far, the most interesting part of my Subject.

It is really amusing to read over the many absurd

doctrines contained in physiological writings, concerning the process of secretion ... That the formation of a theory consistent with our present knowledge of the structure of the animal kingdom, is exceedingly difficult, no one will pretend to deny; but that most of the explanations heretofore advanced on this point, are completely ridiculous, is almost self evident to any one who will investigate this subject with sufficient attention, and who is at the same time duly impressed with the great influence which the "vita propria" of those parts, to which the office of selection is allotted, must have in the performance of that duty ...

The first doctrine I shall notice, and which has had many advocates, is that one which supposed all the secretions completely formed, to be contained in the mass of blood; and secretion, in accordance with this principle, was merely their seperation by means of the glands ... A difference in the diameter, length, and convolutions of the vessels, and an imaginary variety in the holes with which the glandular system was supposed to be

perforated, were employed as the means of rendering the mechanism of Secretion intelligible —

Such an explanation, is superlatively theoretical, and too silly to require a refutation; it is referring to a mere mechanical operation that, which can only be accomplished, by taking into consideration the vital properties of organized matter; besides, how is it possible to conceive of the existence of inorganic pores in a part possessing all the properties of an organized body; since every natural aperture must be regulated by the laws of vitality — With as much propriety might we talk of making bile, Semen, or urine, by a mechanical mixture out of the body, as to attempt an explanation of Secretion by a theory so visionary —

Another of those hypotheses, is, that the blood suffers certain changes as it approaches the glands, and having entered them, is found to be of a composition suitable to its particular ~~gland~~ organ — It is declared that the vessels are disposed in such a manner, as to effect particular and peculiar changes

in the fluids they circulate; and that this is a preparatory Step to the final process. As the most decided evidence in support of this whim, the he=patic organ is cited. The Structure and number of vessels surrounding and entering that viscus; the different proportions which the vessels carrying red blood bear to those conveying a light coloured or whitish fluid; the various temperatures supposed to be caused by these proportions; in fact any thing and every thing which we can imagine to influence in the slightest degree the nature of the blood, are believed to be sufficiently numerous and diversified to cause changes in the fluids favourable to the com=position of ~~the~~ bile on approaching the liver; urine in the vicinity of the kidneys; of milk in the neighbour=hood of the mammæ; and in the same way through=out the whole of the glandular System. This proper=ty appertaining to the vascular tissue, was supposed to depend, likewise, on an increased, or decreased circu=lation of the fluids; in a warming or cooling of the blood;

1 The secretion of the liver is an exception to this rule; the bile is formed exclusively from venous blood, and were this the proper time and place, I think, I could very well account for the fact, that where the vena Portarum had not entered the liver, still bile has been produced from the blood brought by the hepatic artery. This unusual nature so seldom occurs, that many are inclined to disbelieve it; but I think of the fact there can be no doubt in

or in loosing some of its principles by absorption —
But where is the foundation for this theory? Is it
supported by a single fact? I answer no! Every prac=
=tical idea we are possessed of, is decidedly opposed to
it — Is there a solitary individual to be found, at this
time of day, in defence of such an absurdity? I trust,
indeed I feel confident, that no such Quixotic Physi=
ologists is to be met with — That the arteries entering
the different glands convey blood as pure and unchang=
ed as that which proceeds immediately from the left ven=
=tricle of the heart, will not now be denied by any man,
who possesses the slightest degree of information in the
Science of medicine —

I shall notice but one more of the opinions ad=
vanced by physiologists, intended to explain the me=
thod of secretion — It is one held by many medical
men, even in the present day, and as it is clad in con=
siderable obscurity, may be well calculated to mislead
those, who have given but a careless attention to the sub=
ject, or who have not viewed it with that degree of exact=
=ness

which should mark the examination of every theoret=
=ical opinion — It explains the differences of the
secreted fluids, by the peculiar arrangement of
each gland — Ruysch, who was, as we have already
observed, uncommonly expert in making very fine
injections, was led to remark, that the ultimate
ramifications of the vessels differed in the different
secretory organs: it is possible that this may be true;
but as we have already shewn that the final struc=
=ture of the glands is yet a matter of controversy, and,
to say the most in its favour, exceedingly difficult
if not impossible to distinguish with any degree of pre=
=cision; a theory, therefore, built on a foundation so
frail must necessarily be in a very tottering condition;
for the closer it is investigated the more objection=
able does it appear — Before it can be admitted,
its advocates must shew in the clearest light the
exact differences between every glandular viscus, and
the precise manner in which the organization of
each gland terminates — But it is not even supported

by comparison; for we see in the structure of the kidneys and liver a very great similarity, but their products are totally dissimilar. It cannot therefore be looked upon in any other light than a mere assumption.

Before I proceed to lay down that theory which seems to me to offer a better explanation on the process of secretion than any I have yet spoken of, or indeed than most of those contained in the best on physiology, I have one question to propose and to examine; it is this. In what manner and to what extent are the secretions influenced by the nerves? We well know that all glands are supplied with them, and we might reasonably conclude, that they influence very considerably the office of selection. This we accordingly find to be the case; for in a late work on animal chemistry by Dr. Berzelius, professor of chemistry at Stockholm, it is positively asserted, that if all the nerves going to a secreting organ are divided, secretion will cease, notwithstanding

the

continued circulation of the blood — I am well aware that this is denied by Bichat; but his reasoning and conclusion appear to me by no means correct — He says: "I divided the nerves of the testicle in a dog; the gland inflamed and suppurated; but the latter occurrence shews that nervous influence is not necessary for secretion, since suppuration is accomplished in a manner analogous to that of the latter function" — Now it is not pretended that the pus thus formed was selected and thrown out by the proper excretories of the gland; but on the contrary either from an inability on the part of those ducts to perform their functions, or from the irritation produced in consequence of the retention of those elements which ought to have been taken up; or more probably from both those causes combined, inflammation and suppuration was the consequence — It is also a fact perfectly well established that neither the peculiar apparatus of the testicle, of the liver, or of any other glandular

viscera is necessary in accomplishing the suppu=
=rative or ulcerative process; for we see it every day
induced in parts where no particular glandular
arrangement is visible; it seems to be a power
possessed by all the vascular parts of the animal
kingdom, when ever inflammation, no matter from what
cause, has transcended a certain point; and there=
=fore Bichat's experiment would lend rather
to confirm me in the opinion that the nerves of each
gland are absolutely necessary to the proper perform=
=ance of its duty; for if that had not been the case
neither would inflammation nor suppuration, nor
any other diseased action, have occurred in the testicle in consequence
of the operation. But this is further confirmed by
the known influence which certain passions of the mind
are known to possess over many of the secretions. Thus,
every one knows how much the secretion of the sali=
=vary glands is augmented in a hungry person at
the sight of food; it is still more strongly exempli=
=fied in the profuse discharges from the lacrymal

glands, from certain impressions on the Senses; and also from the suppression of perspiration from similar causes. It is well known that dread or fear has a remarkable effect on the Secretion of the kidneys, causing them to discharge very copiously a pale coloured limpid urine. These facts, I think, are sufficiently convincing so far as relates to a certain degree of influence possessed by the nerves over the secreting organs; but the next point is much more difficult to settle. We have proved that the nerves modify very materially the quantity and quality of the Secretions; but how is it that in the liver bile is formed, in the kidneys urine, in the mamma milk &c.? I must acknowledge that I cannot produce proof as positive on this point as on the first; but why may we not attribute it to ~~the~~ nervous influence; since it is from the same source that the ~~tongue~~ is endowed with the Sense of taste; the Schneiderian membrane the property of distinguishing peculiar odours; the ears, the power of discriminating particular Sounds;

~~each glands~~ by the touch we are able to convey to the sensorium the exact surface, which any body, presented for our examinations, may have. As yet, I believe, no satisfactory explanation has been given on this subject; but if the characteristicks of those senses are to be considered as depending on the nerves, and I presume they cannot be accounted for in any other way, why may we not refer to the same cause that power which glands possess of selecting those ingredients, calculated to compose the ~~whole~~ fluid they are destined to secrete? Surely the inference is a fair one; and to this power, modified, as I shall have occasion presently to explain, I must attach the sense which each secretory apparatus has of choosing from the general mass of blood, those elements, which, when united, form its characteristick production.

So far then I think I have very clearly elucidated one of the most important points in the theory I am about to offer. If then these points be

concluded I will next proceed to explain more fully my ideas concerning this singular function —

In the mass of blood we know are contained all the requisites necessary for the formation of the different secretions, viz Oxygen, Hydrogen, Nitrogen, Carbon, Potash, Soda, Phosphorus, Sulphur, a little lime and a small quantity of iron — These in combination enter the gland; it should be kept in view, that the blood is possessed of the principles of vitality, and of course governed by its rules: in this state when it is presented to the mouths of the secreting ducts; they being, as I have already shewn, endowed with the power of selecting, and which is stronger than what the particles thus chosen have for the general circulating mass; they leave this mass and are taken up by the secreting ducts, and at the same time, the affinity existing between the elements thus selected, comes into play and a chemical combination takes place, influenced and directed by the vital properties of the fluids and also of the parts in which this combination is effected; the whole resulting in the formation of a fluid which is the proper secretion of that gland in which it is accomplished —

This then is the manner in which, I believe, secretion to be effected; it appears to me, to agree better with the admirable structure of the human frame

than either of the theories I have elsewhere examined, or than many of the explanations advanced by a host of writers on physiology are.

The vital principle to which I refer, I consider to be a peculiar power appertaining to living or organized matter; and which influences and modifies, in various ways, the operations of those parts in which it exists; but how far its influence extends, or what are the exact changes it is capable of inducing, is a mystery which I fear no human ingenuity will ever be able to unveil.

It may still be demanded, why, if glands are possessed of such qualities as I have assigned them, is their apparent structure in many respects so diversified; because if they are in reality governed by the rules I have supposed, they might just as well be altogether alike in their form and texture, as to be, as we know they are, totally dissimilar — This is the very point on which I have founded my classifications — I have supposed, and I think with great probability, that the more the secretions differ in their sensible qualities from the fluid out of which they are formed, the more complicated does that vessel appear by which they are seperated; or in other words, in proportion as the secretion is complicated, the greater must be the exposed surface of the blood to be acted upon, and therefore the more minute and tortuous must be the ultimate ramifications of the blood vessels — This, I believe to be perfectly consistent with that organization which seems to exist — The serous

surfaces appear the most simple; next the mucous follicles; third an uniform parenchyma, and in this order I think a very fair arrangement may be made.

Whether the classification I have suggested; and the theory I have adopted, be altogether consistent with the opinions promulgated by our Scientific and ingenious preceptor on the practice and institutes of medicine, I cannot positively determine; but if it has been my misfortune to differ with him, I feel the utmost confidence that every allowance will be made by his unbounded liberality for one who may be justly considered, as being merely at the threshold of the temple of Science, when presenting himself to the faculty for the degree of Doctor of Medicine.

In treating of the second section of my thesis, it has been my object to be as precise and as exact as possible in noticing what others have advanced on this subject. I do not, indeed, pretend to have made any discovery on the ultimate structure of the glandular tissues; for it has already been examined with so much persevering industry by the first anatomists the world has ever produced, that were I to harbour such an idea, with the knowledge a student can be supposed to possess, every man of common-

sense, would pronounce it to be the height of folly and presump=
=tion; but of such a charge justice will undoubtedly acquit me.
My sole ambition has been to acquire correct views of what oth=
=ers have taught, and to state them with clearness. If, however
I have been deficient on these points, and I am very fearful
that many inaccuracies exist, my only refuge is the proverb=
bial candour and generosity of that gentleman who directs
the first branch of medical Science in the University of
Pennsylvania.